Sustainable Development Goals and Responsible Innovation

Responsible innovation for sustainable peace, international rule of law and global justice

Meeting the sustainable development goals through innovation

The UN Sustainable Development Goals (SDGs) will shape the international political discourse in the coming decades. In the academic year 2017-2018 Delft University of Technology has explored the viability of a research program offering new possibilities for collaboration to the various parties residing in The Hague. The theme, Responsible Innovation for the SDGs, is aimed at employing the innovative capabilities of the Netherlands for global sustainable development.

The research theme aligns well with the strategic research agendas of the departments of the Dutch government, the missions of a variety of international organizations in The Hague, as well as with research activities of the six Dutch universities which are active in the city: Leiden, Delft, Rotterdam, Wageningen, Amsterdam, Groningen and Utrecht. Innovative solutions to global problems also offer corporate partners, entrepreneurs and start-ups interesting opportunities.

The program is directed towards sustainable development goals that have received less attention from knowledge institutes. Several short-term vanguard projects demonstrate the viability and relevance of utilising innovation research for the SDGs, and an introductory essay sets out the vision for The Hague in the 21st century.

'The Hague in the 21st Century'

How does The Hague remain one of the most important cities in the world in the area of Peace, Law, Justice and Security in the 21st century? The Hague owes its international reputation to recognizing problems and solving them pragmatically in times of high political tension, arms races and rapid technological change in the beginning of the 20th century. The metropolitan region of The Hague is also internationally associated with the cradle of thinking about World Peace and the International Rule of Law, in the persons of Erasmus and Grotius, and with the roots of the early Enlightenment as represented by Spinoza and Bayle.

In order to be able to play a similar role in the world in the 21st century, The Hague is now also facing with the challenge of understanding the nature of the problems of humanity and of offering solutions.

The intellectual climate in The Hague around 1900 pointed towards a 'World Capital'. Competition with other cities was in full swing in this area. Perhaps the most important explanation for the success of The Hague is that it succeeded in placing an important issue on the global agenda of mankind at the end of the second millennium, instead of striving for excellence on agendas proposed by others. The ideas of World Peace, International Rule of Law and institutionalization of Arbitration were invented here.

More than a century after the second peace conference in 1907, the world looks radically different in the 21st century. Complex humanitarian, sustainability and security issues on the world stage are immediately tangible at local levels. This world is complex, hyper-connected, dynamic and unstable. Social media and mobile internet bring great benefits, but also come with many new vulnerabilities.

The international community has drawn up a consolidated list of 17 Sustainable Development Goals (SDGs), similar to the international consensus regarding the so-called Grand Challenges and the Millennium Goals. This list of problems will strongly determine the global debate on a safer and more just world in the remainder of the 21st century.

New in this context is the importance accorded by the UN to the role of innovation, technology and applied scientific research with a strong

multidisciplinary character. It is clear that no progress can be made on solutions to these problems if it is not recognized that technology is both part of the problem and can also be part of the solution. For this reason, the UN has set up a Technology Facilitation Mechanism (TFM) to promote innovative solutions on the SDG agenda. This is an important development within the UN, which for the first time explicitly focuses on perhaps the most important driver of the history of the 21st century: technology.

An important aspect of the SDG agenda is that the problems cannot be treated in isolation, but must be viewed in conjunction. Meanwhile there are decision-making tools that help to understand, model and visualize the interrelationships between the SDGs. Because it is not a list of separate problems, the situation is complex and so are interventions and policy measures.

Another aspect associated with these mutual relationships is the fact that the complexity with which we are confronted requires a new multidisciplinary science that allows us to understand connections and to deal with these problems on a global scale.

To gain a better understanding of complex adaptive systems, multidisciplinary centres for complexity science have been set up in numerous places. In these centres, scientists from different disciplines work together on models and simulations to improve our understanding complex systems in order to better predict their behaviour. On the basis of these models, policy makers arrive at more adequate and responsible interventions that result in improved policies. The outcomes of this type of research are often counterintuitive for policy makers and politicians. Our interventions in social, economic and ecological systems often have unexpected negative consequences. We can, however, not afford such mistakes in combating climate change, humanitarian and economic crises, cyber war and terrorism. Such missteps can be prevented by using new approaches to science that leads to more insight into complex phenomena as a basis for policy.

The new sciences, innovation and technology are necessary to create conditions for achieving the moral objectives that have been specified in the SDGs. The new science, knowledge and expertise are morally blind without normative frameworks, but normative principles without the ability to

intervene are impotent. The SDGs absolutely require *responsible* innovations: innovations that adequately realize the moral ideals of peace, justice and justice and other shared moral values.

The traditional subjects of The Hague will therefore have to take a central place in the work on the SDG agenda: without International Law, peace building, diplomacy, humanitarian aid and development cooperation, protection of human rights, promotion of security, fighting corruption, fraud, organized crime and terrorism, applied science and innovation will miss their desired effects.

Better insight into human psychology has contributed significantly to the manipulation of consumers and voters in recent decades, and only to a limited extent to solving our Millennium Problems.

The traditional disciplines in The Hague will therefore have to play a role in this new world and must connect with other new scientific knowledge and technology. Moreover, in the coming decades, the disciplines of The Hague will also have to make use of new, mainly digital, technology for the development of their own instruments, methods and techniques. Professionals in the fields of law, diplomacy, policy, international relations will have to go digital or nowhere. The Hague could provide expertise that prepares for this new role of international law and innovations within it.

The Netherlands has received international recognition for its approach to innovation. A "Dutch Approach" has become visible. This approach can be extended in different ways through good cooperation in The Hague through a range of triple helix mechanisms. Such an approach is desperately needed in the areas of cyber security, transport and logistics, robotics, energy transition, self-driving cars, industry 4.0, Internet of Things, blockchain, waste processing, circular economy, urban planning, smart city development, fintech and finance, data science and humanitarian aid and development cooperation. In addition to its practical and efficient approach, The Hague has the most official offices of Dutch universities within its city limits and, according to a ranking of the Times, it is one of the top academic cities in the world. The universities within the proposed partnership can jointly perform applied and fundamental research that supports the plans for The Hague's International Agenda, the SDG agenda and the Digital International Legal Order that we will have to work on in the remainder of this century.

The city of The Hague and the Dutch government want The Hague to maintain its position as UN city and international city of Peace and Justice in the 21st century. They also want the Netherlands to continue to play a meaningful role on an increasingly dynamic and chaotic world stage. In order to perpetuate the special position in the world, it is now no longer sufficient to build on the achievements of the past along paved roads. In short, in the coming years in and around The Hague we need to give a 21st century meaning to the theme of Peace and Justice, partly through technological innovations and digitization.

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The Hague in the 21st Century

How can The Hague continue to play an equally prominent role in the world over the next 100 years as it has done in the past 100 years? How does The Hague remain one of the most important cities in the world in the area of Peace, Justice, Justice and Security in the 21st century?

The Hague owes its international reputation to the fact that at the beginning of the 20th century the city recognized the nature and extent of the problems of the world and moreover offered pragmatic solutions in a confusing time of high political tension, weapon deployment and rapid technological development. There is now an equal need for that insight. However, achievements in the past do not guarantee future success.

In this essay we focus our view on new perspectives and new impulses that (i) are not yet a standard part of thinking about the future of The Hague and that (ii) relate to what distinguishes The Hague from other world cities. Of course, The Hague will have to put its smart infrastructure in order, to deal with energy, waste, traffic and transport, and to offer living space, care and culture to its residents. To do so, it will have to become a smart and resilient city, but that applies to every city in the world. Only a handful of cities will be seen as centres of World Peace, Justice and Rule of Law in the eyes of the world.

1. What Happened Previously

The intellectual climate in The Hague around 1900 ambitiously pointed towards a 'World Capital'. Competition with other cities was in full swing in this respect. Brussels also had its eye on the governance seat of a possible new world order, it was also awarded a Nobel Peace Prize (1913, Henri La Fontaine) and there were far-reaching plans for information centres, large libraries (the so-called *Mundaneum*, a paper forerunner of the Internet) and intellectual societies to support its ambitions. Geneva was of course already a prominent contender as Peace Capital, with Nobel Laureate for Peace Henri Dunant and the establishment of the Red Cross (1863). In Bern, the International Peace Office was established in 1891, which also received a number of Nobel Peace Prizes. Vienna was also a cosmopolitan focus of science, art and internationalism around the turn of the century. In Paris, Albert Kahn portrayed the entire world

with photographic innovations (autochromes) as a basis for understanding between cultures.

In The Hague a group of idealists, intellectuals, scientists, politicians and benefactors were active at the time. Important elements of The Hague's plan were, for them, the design for the World Capital of architect De Bazel, a variety of academies and research institutes, the green zones in the city, and the location by the sea. The writer Van Eeden, the mathematician Brouwer, the composer Grieg, the poet Tagore and many others were involved and wholeheartedly supported the plan. They saw education as a vehicle of civilization, internationalism as an antidote to nationalism and protectionism, and the pursuit of synthesis (so-called 'syntheticism') as a means against fragmentation and discord. The idea of bringing together warring parties in a confidence-inspiring, neutral environment with scientific, intellectual, and spiritual resources to find a way out of international conflicts was just what the world needed. Ideas of reconciliation, mediation and conflict management, peaceful coexistence and humanity could easily take root in this environment. This is how the concept of international arbitration came about.

The establishment of the Permanent Court of Arbitration (1899), the construction of the Peace Palace (1913), the Peace Conferences (1899, 1907), and the influence of legal scholars such as Asser (Nobel Prize 1911) in the end laid a solid foundation for the Hague's reputation as International City of Peace and Justice.

> **Such a reputation is built on a widely supported recognition of the fact that a city offers a great scientific, intellectual and professional advantage as a place of business or residence over other places in the world.**

There were many fortunate culture-historical circumstances that made it possible for The Hague and surrounding areas to grow into the place that it is now. Examples include the concept of Dutch neutrality, the discovery of the idea of peace by Erasmus (*Complaint of Peace* 1517; *Dulce Bellum Inexpertis*) in

the early 16th century and the ideas of Hugo de Groot in the early 17th century about ethics, international law and the rule of law. The Netherlands is also, rightly so, associated with the foundations of the Early Modern Enlightenment in the form of the philosophy of Spinoza (who spent a large part of his working life in The Hague, Voorburg and Rijnsburg) and the ideas about religious tolerance and secular ethics of Pierre Bayle (Rotterdam).

The Hague's international reputation in the 20th century, and everything that it has brought the city, must be seen against this impressive and innovative cultural-historical background of the province of South Holland. This 'legacy' influences the Western world to this day. The extensive oeuvre of Jonathan Israel, the Princeton historian of the Modern Enlightenment, shows that the cradle of the Enlightenment can be found in our regions. And when asked about the reason for the influence of the Netherlands on the roots of modernity, Israel commented: "It's the Philosophy, stupid".

NOT ACCORDING TO A PRECONCEIVED PLAN

Perhaps the most important explanation for the success of The Hague is that it succeeded in leaving its own mark on the global agenda of mankind at the end of the second millennium, instead of striving for excellence on agendas proposed by others. The ideas of World Peace, International Rule of Law and institutionalization of Arbitration were invented here.

It is important to note that this special status of cities are almost always 'emergent phenomena' which cannot be produced according to a preconceived plan. Just as with friendship and trust between people, they cannot be brought about through premeditation. In a way, a methodical plan (for example based on city marketing considerations) could even be counterproductive. People who purposely try to win the trust of others often reach the opposite. So the promotion of a city of Peace and Justice – which in important ways revolves around knowledge and trust – can best be achieved through a focus on the best ideas, groundbreaking scientific insights and the most relevant experiences of serving Peace and Justice in the world. Such a reputation is built on a widely supported recognition of the fact that a city offers a great scientific, intellectual and professional advantage as a place of business or residence over other places in the world.

2. Problems of the World in the 21st Century

More than a century after the second Peace Conference in 1907, the world is in a radically different shape. In order to be able to play a similar role on the world stage in the 21st century as a century ago, The Hague now again faces the challenge of understanding the nature of the problems of humanity.

Looking for a balance

The 21st century is highly technological, hyper-connected, and, partly because of that, extremely dynamic and unstable. The world has become very complex through our own efforts. The world is not only disenchanted, but we are all sorcerers' apprentices. People, countries and organizations have become increasingly closely connected in the past centuries via energy, communication and transport infrastructures, logistics chains and institutions. They use the same 'common pool resources' and are therefore very dependent on the decisions and actions of others. Social media, mobile Internet and the Internet of Things bring advantages, but also many new vulnerabilities, fragility and volatility.

> **We cannot get closer to a shared canon of challenges for a better world than this list of goals.**

The world is furthermore too small for its rapidly increasing number of residents and their incessant striving for more economic growth and greater prosperity. Climate and eco-systems deteriorate quickly and irreversibly through human action in the period of the so-called 'anthropocene'. According to the WEF, in 2050 there will be more plastic in the oceans than fish. Large numbers of people are on the move in search of water, food, safety and a better life for themselves and their children. In the course of this century, more than half of the world's population will live in megacities and urban conglomerations of 30 million inhabitants or more. The inequality of wealth, the concentration of power and mountains of debts are increasing in the world.

Artefacts have politics

The fall of the wall in 1986 turned out to be neither the end of history, nor the beginning of a universal Western liberal-democratic form of governance and

government, as Francis Fukuyama announced at the end of the 1980s. Thirty years later, tensions are back in the world, with numerous hot spots in which the battle for the recognition of religious and ethnic identities plays a role. We are looking for a balance between recognition of universal human rights and human nature connecting citizens of the world, and on the other hand their identification with specific historical, ethnic and religious identities that offer security, but which also exclude other people and are often the source of tensions and conflicts.

A wide variety of political and ideological models are currently being scientifically developed and implemented by various superpowers, using advanced digital technology. The arms race has changed into a comprehensive technological race, in which especially China and the US are fighting for dominance and technological supremacy. This race is accompanied by new and large-scale socio-economic experiments with new governance concepts, control systems, social models and view on mankind. With the help of big data, citizen scores, AI and smart surveillance, China is introducing an autocratic political system in which human rights and democratic principles do not play a dominant role. In recent decades, the US have had a holy belief in Silicon Valley as a source of humanity's salvation and the consequence is a minimum of regulation. The ideological and geopolitical blocks of the US, China and Russia are now developing technology that expresses and supports their respective values and norms. As the technology historian Langdon Winner already demonstrated in the 1980s: "Artifacts have politics".

> *This is a significant development within the UN, which for the first time in its history is orienting itself institutionally and systematically on perhaps the most important driver of history in the 21st century: technology.*

What the problems of the world are has by now become clear. The international community has drawn up a consolidated list of 17 Sustainable Development Goals (specified in 169 specific goals). The 'high contracting parties' agreed in New York at the end of 2015 that significant progress will have to be made by 2030 to manage the largest global risks in the fields of water, food, energy, biodiversity, climate, conflict, peace and justice, hunger, poverty, education, child mortality and epidemics. The first and most important goal is to end extreme poverty, according to the UN 'the biggest challenge of our time'. We

cannot get closer to a shared canon of challenges for a better world than this list of goals. Earlier, a similar international consensus already existed with regard to the so-called Grand Challenges and the Millennium Goals. The SDGs will strongly define the global discourse on a safer and more just world in the remainder of the 21st century. But what knowledge is needed to gain insight into promising solutions and the conditions for generating and implementing solutions?

3. The Role of Technology and Innovation

New in this context is certainly the importance attributed by the UN to the role of innovation, technology and applied scientific research with a strong multidisciplinary character. It is evident that no progress can be made on the SDGs if it is not recognized that technology is both part of the problem and can be part of the solution. The UN has therefore set up a prominent *Technology Facilitation Mechanism* (TFM) to promote innovative solutions for the SDG agenda. TFM meets before every High Level UN meeting on SDGs to discuss technology, digital solutions and technological innovations that can help us achieve the global goals. This is a significant development within the UN, which for the first time in its history is orienting itself institutionally and systematically on perhaps the most important driver of history in the 21st century: technology.

NOT A LIST OF SEPARATE PROBLEMS

The fact that problems and solutions can no longer be separated from technology and applied science does not mean that there is a high-tech solution for every conceivable problem. Solutions can also be low-tech, or predominantly conceptual, social or institutional in nature. However, major breakthroughs can be expected from combinations of technical and non-technical innovations. For example, blockchain enables new organizational models, incentive structures and forms of supervision and compliance. It can play a major role in fighting corruption, enforcing international agreements, accountability and transparency in connection with cash flows and logistics chains of food and relief goods. Fair remuneration can also demonstrably benefit local producers and it is easier to control sustainability and safety requirements. The use of large data streams which can be analysed in real time can significantly improve the work of the UN organization. Obviously, a lot of relevant innovations for the SDGs can be expected from artificial intelligence.

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UN organisations will be driven by data and will increasingly use machine learning and AI to interpret their data and formulate their policy.

> **" *Our interventions in social, economic and ecological systems often have unexpected negative consequences. We cannot afford such mistakes in combating climate change, cyber war and terrorism.***

An important aspect of the work on the SDG agenda is that the problems cannot be tackled in isolation, but must be analysed for their interdependencies. Child mortality, education for women, poverty, safety, sanitation, vaccination and affordable care and the availability of water and food are, for example, inextricably linked. The relationship between energy, water and food is referred to as the 'water-food-energy nexus'. The world's food problem, "how can the world produce enough food for 9 billion residents?", is closely related to the availability of artificial fertilizer. The standard method to produce ammonia through the Haber Bosch process costs 2% of global energy demand and produces 1% of global CO_2 emissions. There are countless other examples like these on the relationships and dependencies between problems and between solutions. There are now studies and decision-making tools that help to understand, model and visualize the interrelationships and dependencies between the different SDGs. Working on the SDGs is therefore extra complex because it is not a list of separate problems, but a collection of problems that are interconnected in a very complex way. This also applies to our interventions and policy measures.

4. THE NEED FOR A NEW SCIENCE: COMPLEXITY SCIENCE AND GLOBAL SYSTEM SCIENCE

In order to be able to cope with the problems on a global scale in the 21st century, new science is needed to understand the complexity involved. The problems always concern systems (social, financial, technical and ecological systems, and combinations thereof) and a system approach requires integrated knowledge from a large number of disciplines. The world problems just do not present themselves in neatly classified to disciplines. Slowly the insight is

growing that a Global Systems Science is needed (Helbing et al.) to gain a better understanding of the cross-linked, complex systems we are working on. After the establishment of the Santa Fe Institute multidisciplinary centres for complexity science have been set up in numerous places (Vienna, Zurich, Amsterdam, Boston). Here physicists, data scientists, mathematicians, economists, biologists, computer scientists, social scientists and humanity scholars work together on models to better understand complex systems and predict their behaviour, and on this basis to arrive at more adequate and more responsible policy interventions. Their work uses big data, advanced modelling and methods and techniques from applied natural sciences, mathematics and computer science, such as machine learning, evolutionary game theory, social choice theory, Bayesian statistics, agent-based models, computer simulations, and network science.

THE UNCERTAINTIES ARE VERY LARGE

Results of this type of research are often counterintuitive for professionals and policy makers. A network analysis may for example show that it is not the leaders of terrorist or criminal organizations that are the key figures, but other people who are less prominent in the network. Behavioural economics studies show, for example, that financial incentives in the form of subsidies to promote sustainable behavior can have the opposite effect. In Europe, forestation is increasing, but this is at the expense of forests in developing countries (an area as large as Portugal in the period 1990-2008) due to international trade in sugar, palm oil and rubber.

Our interventions in social, economic and ecological systems often have unexpected negative consequences. The uncertainties are very large and our attempts to limit negative effects can actually exacerbate them. We cannot afford such mistakes in combating climate change, cyber war and terrorism. These phenomena can be better understood on the basis of this new science. We gain insight into unsuspected feedback mechanisms, tipping points, information cascades, network structures and non-linear phenomena, all of which determine successful policy. Insight into complex systems is indispensable. Human behaviour, human drivers and motives, regulation and incentives, the effects of advanced technology, the dynamic properties of ecosystems and the interventions of mankind must be better understood in their mutual interdependencies.

5. GLOBAL ETHICS, FAIRNESS AND INTERNATIONAL LAW

The SDGs do not only imply gigantic scientific challenges, they also express formidable *ethical* challenges: combating hunger (SDG2) and poverty (SDG1) and promoting health and well-being (SDG3) and gender equality (SDG5). Combating inequality is also a general goal (SDG 10). Energy must be 'affordable' (SDG7) and there is a right to 'decent work' (SDG 8), production processes and consumption must be 'responsible' (SDG12). The terms 'equality, affordability, responsibility, well-being, decency' refer to moral categories on which much discussion is possible. The experiences with the Millennium Development Goals have also shown that the methodology for determining progress can be very controversial and that the UN can also adjust the measurement methods and the interpretation of the success criteria in the course of the process.

> **" The traditional The Hague scholarly disciplines will have to connect with other, new scientific knowledge and technology in order to play this role in a new world.**

But applied science and ingenuity stand not self-evidently in the service of a shared moral vision and shared moral values: universal human rights, human dignity and respect for the freedom and autonomy of the individual. New knowledge is a necessary, but not sufficient condition for morally desired solutions. Science and technology can – as we know from history – also be used for less noble purposes. The traditional subjects from The Hague will therefore have to take a central place in the work on the SDG agenda in order to give direction to our ingenuity: international law, peace missions, diplomacy, emergency aid and development cooperation, human rights promotion, security, fighting corruption, fraud, organized crime and terrorism. Without these perspectives, innovations will miss their desired effects.

A NEW ROLE FOR INTERNATIONAL LAW
We gradually understand more and more about the importance of high-quality institutions, the rule of law, trust and ethics for achieving socially optimal

solutions. Research by Amartya Sen, Nobel Laureate in economics from Cambridge, for example, shows that the quality of democratic institutions is closely linked to economic success. Sustainable peace and broad prosperity are not compatible with dictatorships or countries with weak institutions. The state of law and equal opportunities, diversity, open science and solidarity with the weaker, on the other hand, combines well with sustainable innovation and welfare in a broad sense.

The traditional The Hague scholarly disciplines (law, international relations, history, political science, governance and public administration) will have to connect with other, new scientific knowledge and technology in order to play this role in a new world. They will have to incorporate a wide range of other disciplines and take a broader view on the choice and definition of their object of study. Moreover in the coming decades they will have to learn how to use new – predominantly digital – technology, also in the development of their own tools, methods, techniques and *modus operandi*. Professionals in the domain of law, diplomacy, politics and governance will have to go digital or go nowhere. The Hague could provide expertise that prepares for a new role of international law, and innovations in international law.

MEANINGFUL HUMAN CONTROL

Clear examples of technologization can be found in the field of International Humanitarian Law and the Geneva Conventions. The situation has changed completely in the field of warfare and with regard to the nature of armed conflicts. The developments in the 'changing character of war' (the title of a research program at Oxford University) are also not linear. In Crimea it was still about innovations such as the steam train and the telegraph. In the First World War it was still about machine guns, small propeller planes and battle gases. Nowadays, it concerns asymmetrical and network-centric warfare, cyber warfare and the use of artificial intelligence, robot weapons and swarming autonomous drones. One of the requirements for autonomous weapons that is being demanded at the moment is that there is 'meaningful human control' of these systems. What does that mean exactly? How can defence systems be designed for meaningful human control, how can supervision and inspection be exercised?

In the second half of the 19th century, armed conflicts were predominantly disputes between nation states about geopolitical hegemony, disputed territory and territorial claims. Now we have terrorism and massive migration and

refugee flows, triggered by the effects of climate change caused by the West and conflicts originating in inequality, religious and ethnic identities instability in economic and financial systems and shortages of sustainable and renewable energy sources.

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6.   RESPONSIBLE INNOVATIONS

Not every innovation is acceptable or desirable – however noble the goal is that could be served with it. The SDGs need *responsible* innovations: Innovations that realize the moral ideals of peace, rule of law, justice and shared moral values. Responsible innovations are inclusive and try to prevent that the interests of a part of the world population prevail over those of others on the basis of age, gender, nationality or race. Responsible innovations see partial problems in their mutual coherence and prevent new and more serious problems from arising when solving problems, or even increasing existing problems. Smart and responsible innovations also create win-win situations and succeed in reconciling different conflicting values, breaking moral stalemates and solving dilemmas, without undermining fundamental ethical values and legal principles.

> *Smart digital technology must be the expression of European ideals and values, must focus on solving the major problems of humanity, must benefit all equally, and move within existing and shared normative frameworks.*

It has, for example, recently become clear that the focus in the EU on so-called privacy promoting and enhancing technology is now also appreciated in the rest of the world. After decades of critique on the quite severe European data protection, Europe, by hanging on to moral and legal points of departure based on the European Convention on Human Rights (ECHR), has finally received commercial and politically approval. Even Mark Zuckerberg has now admitted that citizens and consumers are probably better off with the European data

protection regime. The international business community is now adhering to EU standards in the area of data protection. Europe has succeeded in developing technology that allows us to use data and at the same time protect privacy. Something similar has occurred with the German lead in the field of clean tech and renewable energy. This idea of responsible innovation – the intention to consciously shape technology and innovation to solve social problems and to let values play an important role - is now anchored in the innovation policy of the European Commission (Horizon2020). Brussels has made around 500 million euro available for Responsible Research and Innovation (RRI) in the period 2012-2020. Also in the 9th Framework Program for the years after 2020, in which an estimated 100 billion will be available for research, a substantial budget is again being reserved for Responsible Research and Innovation.

The basic idea in European thinking about responsible innovation originates from a research program of the Netherlands Organization for Scientific Research (NWO), entitled Socially Responsible Innovation (RI). In this program, knowledge institutions, industry, government and social parties work together on responsible innovations. In The Hague (OCW & NWO) about 30 million euro was spent on research in this area in the period 2007-2017. Socially Responsible Innovation is now a cross-cutting theme in the Dutch Top Sector policy. The Ministry of Economic Affairs has an RI-in-Energy program and employers organization VNO-NCW has recently decided to start a so-called 'business ambassador table' in this area. The partnership of the universities of Leiden, Delft and Rotterdam provides a successful, joint minor "Responsible Innovation" in The Hague, in which around 100 students from Leiden, Delft and Rotterdam work in urgent social issues in The Hague.

5.0 WORLD

This approach is now also being used by Emmanuel Macron to position his large AI initiative in relation to the US and China. Artificial Intelligence should, according to Macron, be designed, developed and used in accordance with fundamental European values, as laid down in various conventions and conventions, in particular the European Convention on Human Rights. Smart digital technology must be the expression of European ideals and values, must focus on solving the major problems of humanity, must benefit all equally, and move within existing and shared normative frameworks. These frameworks, we should note, still have to be formulated for a lot of new technology. Macron: "If you do not want to block innovation, it is better to frame it by design within ethical and philosophical boundaries".

In Germany far-reaching automation and robotisation of production processes is being referred to as "Industry 4.0". The financial sector that is trying to get a grip on cyber currencies, big data, AI and block chain is also referred to as "Finance 4.0". Japan is already a step ahead. The Japanese government does not speak about the 2.0 or 3.0 versions of a technology, sector or social phenomenon, but about the ideal of "Society 5.0". With that the official Japanese government documents refer to the ideal of seamlessly connecting the latest technology and the responsible use of it to solve the social problems. The harmonious coexistence of man and machine, the sustainable symbiosis of people and smart things in a smart society. The Hague faces the task of claiming an important role in thinking about an international legal order, humanitarian aid, human rights, development cooperation and global justice and international humanitarian law in 5.0 World.

7. Economic Perspective

There is enormous economic potential in the combination of a new digital knowledge infrastructure and socially and morally driven responsible innovation. According to Jeremy Rifkin, who stood at the cradle of German industry 4.0 and Chinese infrastructure investments, only the replacement of communication, transport and energy infrastructures through decentralized digital 'internet' systems enable new explosive growth. Where the replacement of the communication infrastructure has already been completed thanks to the internet, it is now important to replace our energy and transport infrastructure with a digital decentralized system, based on the communication infrastructure. New sources of sustainable energy and autonomous 'self-driving' transport will only really get our economy growing again when they base themselves on the structure of the open internet. According to Rifkin, this internet is characterized by economic possibilities with a moral meaning, such as equal access, and the possibility to produce and consume additional products and services at very low costs.

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Also according to Kate Raworth's *Donut Economics*, economic science and economic policy can only regain itself when moral goals, namely a socio-economic lower limit and a climatic upper limit, determine the direction of economic growth driven by technological innovations. According to Maria Mazzucato, the role of the government and other public institutions is decisive in this, not only as a regulatory power, but also and primarily as a driver and fundamental source of technological innovation. Mazzucato shows that the role of the government in the creation of fundamental technology through academic and military research stood at the cradle of the digital technologies that now determine our communication infrastructure, such as the GPS, the touch screen and the internet. So-called innovative private giants only play an essential role in bundling the innovations made possible by fundamental research and infrastructural investments. Leading research by Harvard innovation expert Michael Porter shows that social and moral values can also play a decisive role in innovation processes for the private sector.

The Netherlands has received international recognition for this approach to innovation. A "Dutch Approach" is becoming visible. Dutch water management and engineering could serve as a seminal example. In areas such as coastal and port management, flood control, water treatment, irrigation techniques, water accounting, water diplomacy and water education the Netherlands continues to set the tone internationally, with business and entrepreneurship, science and innovation. This is being promoted internationally with great success by the Netherlands (for example in the person of the water envoy Henk Ovink). The Dutch business community in the water sector and the maritime sector can capitalize on this and at the same time contribute to the mitigation of major flooding problems that threaten large parts of the world's population.

FAVOURABLE CONDITIONS

There is no reason why such a 'Dutch Approach' could not be realized in many other areas through good cooperation in The Hague by means of a range of triple helix mechanisms. Such an approach is, for example, urgently needed in the areas of cyber security, transport and logistics, robotics, the energy

transition, self-driving cars and industry 4.0, Internet of Things, Blockchain, waste processing, the circular economy, urban planning, the development of smart cities, fintech and finance, data science and emergency aid and development cooperation.

> **" This cooperation could draw national and international attention and lay a solid foundation under The Hague's position as City of Peace and Justice in the 21st century.**

Again there are a number of favourable conditions for this approach in the Netherlands. A number of important basic conditions are the education level of the population, health, high-quality infrastructure, social stability, high-quality science and high-quality education. In addition in the Netherlands we have, in comparison to other countries in the world, a large capacity for radical interdisciplinary cooperation, a high-quality institutional environment that inspires confidence and nurtures trust and which enables parties to keep information and transaction costs low. Furthermore,the small Dutch scale is ideally suited to serve as a living lab and to deliver proof of concept of innovative ideas in many areas. Leading people in industry and business, public administration and civil society and NGOs generally embody a healthy balance of education and training, integrity and reflection, pragmatism and commercial spirit. A well-functioning democracy and a Rhineland model also ensure diversity and representation in important decision-making processes on the basis of a wide variety of visions, voices and interests. Collaboration from shared goals that transcend disciplines, an integrated approach, a system approach and thinking in terms of cycles and chains are the rule rather than the exception.

Finally, a characteristic that has long been perceived as problematic is perhaps an advantage in the 21st century: the willingness, inclination and ability to engage in moral deliberations. When it comes to Socially Responsible Innovation, this is an important resource: to want to and be able to reflect on the world and one's own actions in terms of values and principles. Developments in the field of science and technology are moving so fast and are so far-reaching for society and human relations in the 21st century, that any innovation that is not responsible can bring humanity - or large parts of it - to the brink of an existential crisis.

8. A New Foundation: Collaboration between Dutch Universities for the SDGs

Of all Dutch cities The Hague has the most official offices of Dutch universities within its city boundaries. There is an existing partnership between the collaborating universities of Leiden, Delft and Rotterdam (LDE). There are also branches of the University of Amsterdam (Asser Institute), Wageningen (Wageningen Economic Research) and Groningen (Dutch Demographic Institute). These six universities are among the top 100 universities in the world and can jointly carry out applied and fundamental research that supports the plans for a new The Hague International Agenda, the SDG agenda and the Digital International Rule of Law that we will have to work on in the remainder of this century. This cooperation could draw national and international attention and lay a solid foundation under The Hague's position as City of Peace and Justice in the 21st century. These six universities are very complementary when it comes to responsible innovation for the SDG agenda. The Hague University of Applied Sciences also provides master-level education in The Hague. Education and research at this level could be very useful and could help to bridge the gap between practical applications, SMEs, start-ups, and the prototype development of services and products.

> " *Applied science, new technology, innovation and high-tech entrepreneurship can bring many new opportunities for a The Hague global justice agenda.*

In order to play a significant role, the cooperating universities could be encouraged to develop a joint SDG research agenda. Discussions are taking place with NWO and the Dutch ministries to start a Research Program "Responsible Innovation for the SDGs" (3 million euro), which can help to further shape the research agenda. In addition The Hague can join a new VSNU initiative for the thirteen cooperating Dutch Universities: "Digital Society". The legal faculties in particular should stimulate their International Law and E-Law departments to shape the innovation research agenda of international law in

the context of this VSNU cooperation. UVA, Tilburg, Groningen and Leiden have proven international track records in this field. Existing The Hague initiatives such as Legal Delta and Security Delta, in which private parties are also represented, can support this.

9. FUTURE

The city of The Hague and the Dutch government want The Hague to maintain its position as a UN city and international city of Peace and Justice in the 21st century and that the Netherlands will continue to play a meaningful role on an increasingly chaotic world stage. The Peace Conferences of more than a century ago, the Peace Palace and the establishment of international courts have given The Hague and The Netherlands the reputation of honest broker and trusted party. In order to consolidate this special position in the world, it is now no longer sufficient to build on the achievements of the past along the beaten track.

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The Hague can be a Dutch focal point of smart and responsible innovations for the world issues of today and tomorrow.

Applied science, new technology, innovation and high-tech entrepreneurship can bring many new opportunities for a The Hague global justice agenda. Technological innovation – in particular in the field of digital technology (Internet, Internet of Things, Artificial Intelligence, Big Data, Robotics, mobile telephony, block chain, social media) - also plays a crucial role in realizing the goals and ambitions of the UN Sustainable Development Goals (SDGs) program. The UN has recognized this and has created a new instrument to exploit the new technological possibilities for humanitarian goals, the so-called Technology Facilitation Mechanism. This gives rise to new possibilities for science diplomacy and technology diplomacy.

To support the new plans, a number of knowledge infrastructural facilities are needed. Consideration can be given to the following elements:

1. Innovations for the humanitarian world
2. Data Science Centre for Peace and Justice

3. The Hague Security Delta: Quadruple helix collaboration on security and cybersecurity.
4. Centre for E-Law, Digital Innovation in Law based on a coalition of collaborating Law schools in Netherlands.
5. UN SDG Institute: Policy analysis for Real World problems.
6. Digital Peace Palace & Peace Room: Venue, Academy, Library, digital archives, E-library
7. The Hague Institute Coalition: Collaborating non-academic Institutes Clingendael, HCSS, E&P, HIIL.
8. Interdepartmental Strategic Knowledge Innovation Agenda Meeting, with a focus on Innovation and Digitalisation.
9. Research Program Innovation in International Law & platform for an International Digital Legal Order program, with collaboration from NWO, VSNU, KNAW.
10. Digital Innovation District (Hub for IT and law start-ups)

10. TO CONCLUDE

The work on the SDG agenda requires *responsible* innovations. The Netherlands is internationally leading the way. The NWO program Socially Responsible Innovation has been copied in many places in the world. The Hague can be a Dutch focal point of smart and responsible innovations for the world issues of today and tomorrow. Innovations for the SDGs will also need to be innovations for Peace, Rule of Law and Justice in order to lead to sustainable and peaceful solutions and to realize the moral goals of equality, freedom, human dignity, welfare, security and sustainability.

This new focus directs technical, social and institutional innovation towards issues that are central in The Hague and in connection to which new business and entrepreneurship can grow. On the other hand, it orients traditional disciplines in this domain (Law, International Relations) towards the innovative potential of technology.

CONTINUE THE IDEALS

One thing seems clear: If the City of Peace and Justice does not take a leading role in the digital age and a world of high technology, and fails to deliver high-quality and completely unique knowledge of the world's problems, then it will

impossible to maintain the current leading position in the long run. The city will slowly become irrelevant as a unique source of knowledge and locus of expertise. The Hague will in that scenario get a lot of competition in the field of international law, arbitration, and knowledge and expertise in the field of global governance, and become an international congress city flavoured with 'Peace and Justice', as there are many in the world. What can distinguish the city permanently is its academic knowledge base, unique locus of expertise, and its breeding ground for the professionals of tomorrow.

The 'Dutch Approach' is characterized by designing for values and principles, innovating for peace and justice, a broad system approach to problems, an ability to look beyond the boundaries of disciplines and specializations, working with many stakeholders, with a pragmatic and solution-oriented approach, design-oriented and anticipatory thinking and the willingness to adopt a normative point of view.

This allows The Hague to continue the ideals of the founders Erasmus, Grotius, Spinoza and Asser, for the benefit of its inhabitants, the Netherlands and the rest of the World.

Summary of Project Outcomes

The projects in de Delft Pilot all address responsible innovation in the service of achieving the sustainable development goals, but vary in how their topic is demarcated:

- Some projects start from a **technological development** that raises concerns and/or offers opportunities: autonomous weapons systems (project 3), blockchain (project 7), serious gaming (project 8), drones (project 10) and artificial intelligence (project 12).
- Other projects depart from a **societal challenge**, such as climate-driven water conflicts (project 1), livelihoods for refugees (project 2), dealing with worldwide migration streams (project 6), legal empowerment (project 13) and quality of life in the fast-growing cities of the world (project 14).
- Noteworthy is that several projects address **humanitarian aid and disaster response**, namely the projects on airport efficiency in humanitarian disaster response (project 4), on using blockchain for humanitarian aid (project 7), on the safety of humanitarian aid workers (project 9), on serious gaming for improving humanitarian aid (project 8), and on high-quality collective intelligence for humanitarian aid initiatives (project 11).
- Not surprisingly, **the law / legal systems** is also an important topic or aspect in several projects, such as on the E-court of the future (project 5), on artificial intelligence and international law (project 12) and on legal empowerment (project 13).

The projects can thus be classified in various ways. They complement each other nicely, and together they set an intriguing agenda for the expertise that The Hague needs to develop to maintain its position in the world as capital of Peace and Justice.

1. WATER CONFLICTS; DATA TECHNOLOGY DRIVEN SCENARIO PLANNING AS A BASIS FOR POLICY MAKING

As the impact of climate change is predicted to significantly disrupt hydrological cycles, the odds of conflicts over water are also liable to increase. Given this situation, the Ministry of Foreign Affairs has recently expressed the need for a stronger knowledge base on international water governance and conflict management. Can the absence or presence of water – in the form of scarcity of drinking water or disrupting and dangerous floods – be used as an indicator for global strife in the future? David van Putten, Neelke Doorn, Jan Kwakkel (TU Delft), Marjolijn Haasnoot (TU Delft and Deltares) and Karen Meijer (Deltares) explored this topic and recommend data and technology-driven scenario planning as a basis for policy making to prevent and solve water conflicts.

There already exists a range of quantitative studies on the relation between climate change and conflict. Doorn and associates conclude, however, that the usability of this body of literature "remains highly limited, as it can at best inform us about global levels of conflict, while telling us little about the particular pathways by which water conflicts come about." The reason is that there are numerous causal chains from drought to conflict, making it difficult "to construct a tight and multi-linked narrative of how various causal factors interact." Moreover, "each of these linkages is hard to prove in its own right, as none of them will take place invariably under each situation." And "additionally, each of them is a highly complex matter on its own account and contains a number of 'microgaps' [in our knowledge] that need to be addressed."

The researchers thus question the possibility of "analytic or predictive power, such that it is possible to make determinate statements about the role of water in ongoing or future conflicts" in the absence of plausible hypotheses about how such a conflict comes about. Their paper illustrates this difficulty with the case of the Syrian civil war, a conflict for which research has so far not been able to confirm claims made by various politicians that water played a key role. They do identify a number of plausible

scenarios by which water conflicts *could* come about, such as transboundary water sources in the absence of institutionalised agreements. Instead, the researchers propose to work on "the construction of large-scale scenarios for future water conflict events." Such a scenario planning approach

> "is aimed at systematically exploring the consequences of various possible future events. It abandons attempts at prediction, by focusing on a more open image of the future as consisting of multiple branching pathways. [...] Rather than committing to a fixed image of the future, scenario planning treats the future as a set of hypotheticals, each of which may be anticipated for by a policy response."

This approach, the researchers argue, has clear advantages: "it allows for humility in the face of the inconclusive data, while also enabling policymakers to developed short-term plans of action in the face of an uncertain future." The Netherlands already has a lot of experience with scenario planning, they note, but "what does not exist is a systematic set of policy recommendations focused specifically on future water conflict scenarios, combined with possible foreign policy measures that can be adopted by the Netherlands in response to these scenarios." The researchers propose to adopt a research agenda with the following central questions:

- How can current scenario-building methodologies be applied to the topic of water conflicts?
- What role can data and computer modelling play in mapping out these problems and assessing interventions?
- What knowledge exists on the mediation of water conflicts that may arise in the future?

2. REFUGEES AND ICTS: INNOVATING TOWARDS INCLUSION AND INTEGRATION IN FRAGILE ENVIRONMENTS?

Refugees have been shown to be apt in developing diverse coping mechanisms, but face many legal, economic and social restrictions in their attempts to make a living. The 'bottom-up' product and process innovations of refugees are frequently cited as instrumental to people's resilience and livelihoods. Refugees in camp situation have been described as 'untapped' resources that can be potential 'entrepreneurs' and 'innovators', particularly if linked to commercial partnerships. However, in fragile environments, with few formal institutions, there is also a risk of the perpetuation of negative economic development that fosters unproductive and destructive enterprise. Holly Ritchie (ISS, EUR) notes that policy makers have little systematic attention for this topic and explores it in her issue paper, with a focus on ICTs. In addition, she also addresses the opportunities and problems with ICT applications for refugees developed elsewhere.

Ritchie's literature review reveals that "established technology and ICT-related initiatives that are currently supporting refugee integration" can be grouped by four themes: (1) access to local services and housing, (2) access to work or training, (3) access to communications and connectivity, and (4) tools to improve 'receptivity' towards refugees by host communities. Under each of these headings she identifies several examples of emerging 'digital' humanitarian innovations for refugee support and integration. These tools and initiatives have received various criticisms:

- There are "duplicate tools" and "several similar apps developed for similar services"
- They are "dislocated from actual refugee populations and their diverse needs"
- They often reach "only small numbers of refugees"
- Apps are regularly "out-of-date" and "vary in quality"
- Despite much hype, many of them "are deemed not relevant or sustainable"

An underlying problem is that most of this technology is developed in Europe, away from the context of application. There are not enough rigorous academic studies on local relevance or actual impact. The abundance of hackatons, challenge prizes and open competitions does not necessarily help for creating appropriate and sustainable solutions. Quality and practice standards are lacking. Most importantly, perhaps, is that "few apps were designed together with refugees."

Possibly "it may be more efficient to create improved government websites that are mobile-friendly, multi-lingual and responsive to user needs than third party apps." Certainly, technology entrepreneurs need to "better respond to refugee needs, and to coordinate with NGOs, local government and policy-makers that have the necessary resources and networking power, and the ability to make policy changes for effective design, targeting and impact." Furthermore, there needs to be attention for the fact that ICTs may also create new vulnerabilities for an already vulnerable group. And also in refugee camps, it comes with risks regarding personal surveillance, misinformation, and usage for illegal activities.

As for bottom-up innovation of refugees that lead to income generation and entrepreneurship, Ritchie concludes that "while ICT-related refugee businesses may still be limited", it is nevertheless the case that "mobile phones are emerging as a fundamental, all-encompassing 'tool' for refugee livelihood strategies, supporting the search for employment, running of small businesses and access to ancillary services." The paper discusses various trends in social inclusion and digital literary, the existence of a digital gender divide, and various push and pull factors that determine whether an environment is 'enabling'. Three key sets of initiatives from a humanitarian aid perspective that influence refugee innovation and enterprise are community technology access centres, microfinance and community based organisations. Also interesting is the emergence of digital platforms that provide services and training (e.g. *Refugee Code Academy*). An important conclusion of the issue paper is that "at present, bottom-up innovation is more often supported by the local market or by other refugees, than by the support of the international community, or by local formal services."

The paper has to a large degree relied on 'grey' literature, as academic research on the topic is scarce. One thing that needs more attention is the heterogeneity of refugee groups and their situations, as "the treatment of refugees as a homogenous group of people that become 'innovators' in displacement is still a common [but unjustified] narrative". Interesting questions for future research include the following:

- What does the process of refugee innovation in enterprise look like?

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- How do different refugee groups realize the potential of ICTs in supporting different aspects of their livelihoods?
- How does the current landscape of digital humanitarian innovation support emerging refugee innovation and enterprise?

3. Meaningful Human Control and Lethal Autonomous Weapons Systems

"Debates on lethal autonomous weapon systems have proliferated in the last five years. Ethical concerns have been voiced about a possible raise in the number of wrongs and crimes in military operations," so the researchers in this project, Jeroen van den Hoven and Filippo Santoni de Sio (TU Delft), note. As such incidents tend to significantly disrupt people's lives and living environment, avoiding such harms as much as possible would be instrumental to achieving a range of different sustainable development goals. Moreover, there are concerns "about the creation of a 'responsibility gap' for harms caused by these systems" – which has direct relevance for the achievement of SDG16, to which accountability is central. Investing in research in *responsible* innovation in this area is thus called for if we accept the reality of the existence of such weapons. This project lays a basis for such research.

The project has resulted in a paper presenting the first rigorous conceptual analysis of a key notion in the legal-political debate about lethal autonomous weapon systems, namely that of 'meaningful human control.' This paper has been accepted for publication in the journal *Frontiers in Robotics and AI*. The abstract reads as follows:

"[…] according to this principle [of meaningful human control], humans not computers and their algorithms should ultimately remain in control of, and thus morally responsible for, relevant decisions about (lethal) military operations. However, policy-makers and technical designers lack a detailed theory of what 'meaningful human control' exactly means. In this paper, we lay the foundation of a philosophical account of meaningful human control, based on the concept of 'guidance control' as elaborated in the philosophical debate on free will and moral responsibility. Following the ideals of 'Responsible Innovation' and 'Value-sensitive Design,' our account of meaningful human control is cast in the form of design requirements. We identify two general necessary conditions to be satisfied for an autonomous system to remain under meaningful human control: first, a 'tracking' condition, according to which the system should be

able to respond to both the relevant moral reasons of the humans designing and deploying the system and the relevant facts in the environment in which the system operates; second, a 'tracing' condition, according to which the system should be designed in such a way as to grant the possibility to always trace back the outcome of its operations to at least one human along the chain of design and operation."

The authors conclude that

"whereas our philosophical analysis offers support to the political concerns of critics of autonomous weapon systems, it also leaves open the conceptual possibility that future weapon systems with a high level of autonomy may remain under meaningful human control, provided that a series of technical and institutional advancements are realized, and their use is properly constrained to the right kind of operations."

Further research is needed on the implementation and operationalisation of the conception of Meaningful Human Control as specified in their paper, in the form of the articulation of concrete design requirements for procedures, protocols, weapon systems and socio-technical systems in network centric warfare.

# 4. AIRPORT EFFICIENCY IN HUMANITARIAN DISASTER RESPONSE

Following an earthquake, tsunami or hurricane, most roads, rail tracks and even ports become unusable, as they are blocked for days by debris. Transport via land can be too dangerous for humanitarians, as convoys are frequently target to attacks. Air transport is then often the only possibility to send urgently needed relief supplies and aid workers. However, this can be challenging, especially for smaller airports that usually experience only moderate traffic. They have to often deal with overwhelmed customs officials, unsolicited aid donations, unsafe or unprepared warehouses, a lack of training in disaster response, and sharing a general frustration of not having the right information. In their project, Bart van der Walle, Maria Freese and Kenny Meesters worked on defining the foundations of a much needed research and innovation program on airports in humanitarian response.

The analyses done in this project have shown that further research and development in this field is needed. A summary of the project results:

"A key element is to examine issues and develop solutions with a more holistic perspective on the role of airports before, during and after disasters. Throughout the project three key pillar of such future program were formulated (see figure):

- The first pillar, **Research & Development**, would focus on the development of innovative approaches, methods and tools to support airports and the related activities, including using an interdisciplinary approach to identify and fill knowledge gaps.
- Secondly the results of this research would be implemented [by means of **Training and Dissemination**]. For example, used to build awareness through advocacy, build (local and international) capacity, revise existing approaches, and provide training.
- Finally, the innovations and build capacity would be utilized during **operational responses**. Examples would be providing (remote) support to

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affected airports, implement novel approaches in the supply chain, and would ultimately feed back into the research and development agenda.
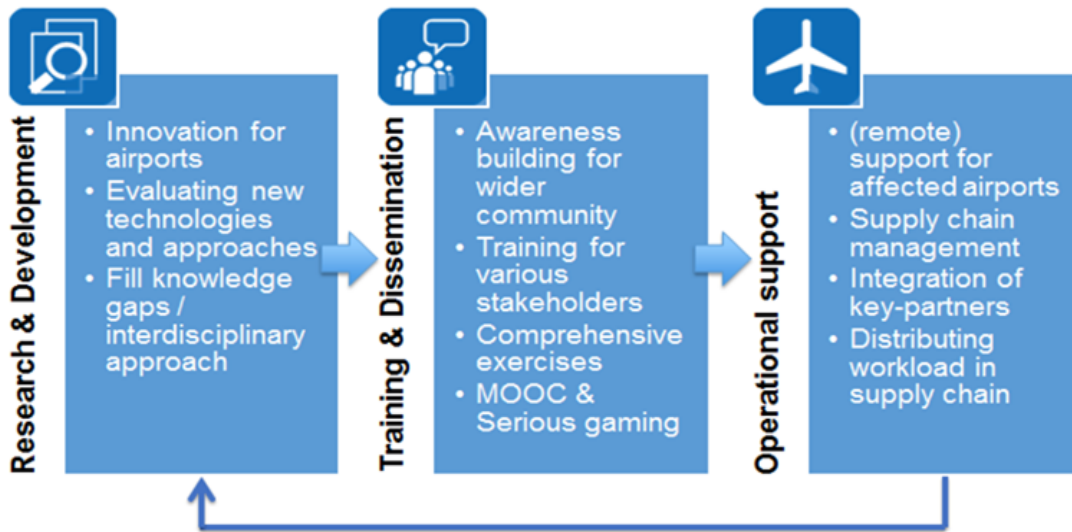
Summary of the research agenda

The work conducted in this preliminary research shows that supporting airports in going from (potential) bottlenecks to an effective supporting element in times of disasters in not an easy or trivial task. The landscape of actors that need take coordinated action is vast, and ranges from both local service providers to international legislative bodies and from humanitarian relief organizations to airline operators. This combined with the challenging operational circumstances during disasters, make airports a critical but challenging element to be managed before, during and after a disaster strike.

While at the moment various programs and actions are undertaken to strengthen the role of airports during the disasters, many of them focus on either specific component (such as cargo handling) or include a limited group of stakeholders (aviation industry). Furthermore, many of the initiatives rely on strengthen existing framework, tools, procedures and policies. However, a paradigm shift is required to move airports from 'humanitarian response bottlenecks' to 'effective logistics hubs'. It requires a more comprehensive look at the system involving actors from the humanitarian, logistics, aviation and governing organizations. Furthermore, existing procedures need to be (re)evaluated and new approaches and (technical) solutions need to be developed to support this change. Finally, awareness, evidence and capacity building are structural elements need to understand, identify and implement these new improvements.

Throughout the project we have engaged with a wide range of local, national, and international stakeholders. We have engaged with representatives of the humanitarian community, the aviation industry and research institutes. Throughout the various interactions, organizations and individualized have emphasized the important of strengthen airports as part of disaster preparedness and response. A key element of which is participating in the Focus Task Force Airport Efficiency, working alongside ICAO and UN OCHA and their partners in raising awareness, inform policy makers and developing new approaches to address the challenges for airports during critical humanitarian operations. Combined with the exploration of the issues, we believe that Delft University, along with its partners is a unique position to facilitate the shift required to change airports from a potential risk to an asset for disaster risk reduction and response."

5. ICC: E-court of the Future

The translation of public values into information architectures faces severe challenges. There are high-level and non-negotiable requirements concerning security, privacy and data protection, accountability, integrity and provenance and sustainable storage of data (in a variety of formats and Big Data). In the operation of the ICC there are all kinds of value tensions by different stakeholders which require a solid information architecture. Openness, for example, is an important value in a process, but at the same time identities should be kept protected (tension of openness vs. privacy). An adequate information architecture can help to deal effectively and efficiently with the main mission of the court, as well as with the value tensions, the sensitive information and various new situations that arise in the world. Boris Shishkov worked on a project addressing this topic.

Unfortunately, this project faced severe challenges in collecting empirical material. n the period that the project ran, Shishkov was neither allowed to visit the ICC, nor allowed to interview anybody from the ICC, nor given any formal documentation featuring the technical (ICT) facilitation of the ICC and/or their (values-related) needs. Therefore the focus was shifted to value sensitive design in information architecture for public organizations more broadly. Although Value Sensitive Design (VSD) provides a method to translate values in application functionalities and also how to handle potential value tension, each time much effort is required on the side of developers. Instead the project worked on identifying reusable patterns, which are generalized ways for problem solving that can be re-used by many public organizations.

A first version of patterns was developed based on a fictive use-case of a criminal court. The patterns are structured in a value-specific but purpose-independent way, allowing for a ("wizard"-driven) parameterization. These enable generalization and the use by different organizations, and make them less case specific. The preliminary evaluation showed that such pattern could "add" a "plug-and-play" functionality to the application, such that its underlying business processes would run in the same way with the only difference that the particular value has been explicitly considered.

Patterns were also identified which can be used to deal with value conflicts, concerning a "value-sensitive" business process "point" from where several steps ahead are possible; then the pattern would "judge" which is the right way ahead, by analysing the current situation and assigning the right priorities accordingly.

The project has eventually led to four co-authored papers on the topic, published by ACM or Springer, titled:

- *Three Categories of Context-Aware Systems*
- *Business Process Variability and Public Values*
- *Composite Public Values and Software Specifications*
- *Enforcing Context-Awareness and Privacy-by-Design in the Specification of Information Systems*.

The last paper, for example, proposes "a design approach that allows for weaving context-awareness and privacy-by-design into the specification of information systems" by extending the 'Software Derived from Business Components (SDBC)' approach. Its proposed "way of modelling would allow developers to smoothly reflect context and privacy features in the application design, supported by methodological guidelines that span over the enterprise modelling and software specification."

6. MIGRATION MODELS FOR POLICYMAKERS

No doubt will there be many migrants, displaced individuals, and asylum seekers in the near and long term future. If preventive actions (e.g. sustainable development) are not taken urgently and to the level required, then Europe needs to prepare for large migration inflows from neighbouring regions. To prevent and be prepared for large migration inflows, insight is needed in causes of migration as well as in the dynamics of migration. Existing studies are often narrative and based on expert knowledge, or based on large amounts of (historic) data. Models are needed to get insight in future migration streams. Some root cause models and migration dynamics models already exist, but they are not integrated. In this project Erik Pruyt (TU Delft), Stefan Wigman, Patrick Steinmann, Erin Bartholomew and Reza Hesan addressed the challenge of integrated migration models in order to explore plausible future migration crises.

The literature on migration identifies several root causes for migration, namely "political root causes (e.g. displacement due to conflict), demographic root causes (e.g. overgrowing population), economic root causes (e.g., lack of economic perspective), social root causes (e.g. lack of education options), and environmental root causes (e.g. desertification of cropland due to climate change)." Questions addressed in the literature on migration dynamics include: "When do people decide to (finally) migrate? How do migrants decide where to migrate to? How do migration routes and hubs come about? What are the effects of closing borders and season influences? What is the role of human traffickers and migration systems/organizations in transit and reception countries? What determines whether immigrants stay or leave?"

The researchers did not just develop a research agenda on integrated migration models, but already did substantial work to realize various methodological innovations. More specifically, they have:

- furthered an innovative hybrid multi-scale modelling software (Anysim),

- developed a new multi-scale systems modelling approach in a traditional SD package,
- developed scripts to extract data from databases and prepare data for multi-scale models,
- developed many simulation models, including three models that merge root causes of migration and migration dynamics,
- integrated data-rich grid-based AB modelling and the radiation migration principle,
- developed techniques to generate visualizations and animations of geospatial simulation model results.

To make these innovations relevant for policymakers, they have worked on different types of cases with / for the Dutch National Police and other organizations interested in migration. One type of cases concerned simulation models of specific migration routes and hubs (e.g. the Balkan route). Another type of cases concerned simulation models of organizational processes for dealing with migration and its consequences (e.g. simulation models of the Dutch identification and registration (I&R) procedure, as well as simulation models of the Dutch I&R (police) and asylum (IND) procedure). Some of their methodological innovations and models are briefly introduced and discussed in the issue paper resulting from this project. However, final analysis and results are not available yet, as these require a lot of additional work, which they preferably do together with interested partner organizations. The results will in due time be published in papers and reports, as will the comparison across these different modelling approaches, and their joint use under deep uncertainty.

7. BLOCKCHAIN FOR HUMANITARIAN AID

In early 2017, seven UN bodies came together to release a UN Request for Information on Blockchain based international assistance, stating that they had "identified the potential of blockchain technology to dramatically improve the efficiency, transparency and accountability in the international humanitarian, development or peacekeeping assistance." Governments, start-ups and NGOs are also exploring humanitarian uses of blockchain technology.[1] Some use cases such as cryptocurrencies, are still only speculative and unlikely to be piloted any time soon. Others, such as supply chain and data management, already have proof of concepts and active pilots. The aim of this project by Bartel van de Walle (TU delft), Thomas Baar (Leiden University) and Johan Powelse (TU Delft) was to explore the humanitarian applications of blockchain technology and to provide practical guidance and advice to those interested in pursuing 'blockchain for good' pilots and applications.

The most advanced blockchain pilot in the humanitarian sector is the World Food Program's Building Blocks. It operates in Jordan and currently supports around 10,000 Syrian refugees by allowing for more direct and less costly financial transactions. UNICEF, for example, has also expressed interest in setting up its own Ethereum-backed cryptocurrency system. Blockchain is an exciting, nascent and disruptive technology. It has numerous potential applications and being is explored and piloted in every single industry. But how will it affect humanitarian and development work? And how can humanitarians approach the subject? Unlike the commercial sector, humanitarians do not have the budget nor the risk appetite to explore such a broad and experimental technology. But they also do not want to get left behind, particularly when blockchain provides exciting opportunity to cut costs, speed up processes and improve transparency and collaboration.

The project, a collaboration between TU Delft's Humanitarian Technology Lab and HumanityX (Centre for Innovation, Leiden University), set out to decipher the current status and ecosystem of blockchain for good applications. For this purpose it charted

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[1]

existing use cases of humanitarian block chain use. The project also evaluated the success of various use cases, thereby informing future decisions on applying Blockchain for humanitarian ends and further research that is necessary.

The project is currently in the process of constructing a decision tree which will help guide the humanitarian and development sectors through blockchain. The decision tree will identify potential use cases for blockchain technology, taking into account the humanitarian context. It foresees to help humanitarians decide what kind of considerations they must make when designing a blockchain application. The decision tree will be accompanied by in-depth explanations and research so that users understand why certain advice and direction is given.

8. SERIOUS GAMING FOR IMPROVING HUMANITARIAN AID

Actors engaged in humanitarian interventions and emergency responses regularly work under ambiguous and hazardous conditions. Heide Lukosch, Yan Wang and Simon Tiendersma have explored and tested using a game-based approach to support this work. The thesis was that, firstly, games can simulate in a safe environment the situations that aid workers experience in reality and thus help with training and decision support. The game also illustrates the multiplicity of organizations involved in disaster management and the role of communication and coordination in conducting humanitarian aid work and crisis response. Games can, secondly, also be used as a research tool to analyze the workflows needed to collaborate and carry out aid work in an efficient and safe manner. Used in this way, games help to better understand the field of crisis response and the requirements that stakeholders have for arriving at efficient and effective collaborations.

There are several challenges with developing and testing humanitarian (information and communication) technology, so the researchers start of their paper. It is "a type of 'human subjects research' […], which requires ethical approval and monitoring." Furthermore it is "imperative to pay attention to data access, not only to sensitive mission data but also the privacy of aid workers". Moreover "the application environments (humanitarian mission fields) for humanitarian technology are very different from its development environment (the lab)", while at the same time "any malfunction of humanitarian technology may lead to fatal loss of humanitarian resources (personnel or goods)". Finally, high-tech is not always the best solution, especially as the usage of technology "could be constrained by the infrastructure and social development of mission regains or the local laws."

The last couple of challenges make it crucial to get more insight into the requirements that actors in humanitarian aid contexts have, and games can help with that (in addition to their potential training and decision support purpose). Games can range from simple

card or board games to extensive role-plays and advanced computerized models of complex systems and situation. Their advantages are, according to Lukosch and colleagues, that games make it "easier and cheaper to study a certain phenomenon" (as compared to studying it in reality), "make a problem more visible for measurement and observation", "allow for the design of controlled experiments", and "offer a safe environment where difficult or dangerous situations" can be explored. Similar advantages apply to using them for training and decision support purposes.

Playing Plaitra with handling various materials

As part of this pilot project a literature review was conducted, examples of serious games for humanitarian aid were collected and a case was taken into account where a board game, called Plaitra, was further developed as part of an existing European research project. One of the findings of this project is that "no accepted framework for game-based interventions in this field does exist." The following questions should be central to follow-up research:

1. "How to support humanitarian aid workers on the operational and strategic level with the means of serious games?
2. What are the main application fields for serious gaming in humanitarian aid?
3. What are the most applicable game elements and mechanisms to address the application fields?
4. How does a framework for serious games in humanitarian aid look like that guides practitioners, trainers, and researchers to select the right approaches towards a valid serious game design?"

They recommend actively involving experts from the field – for example from Red Cross NL and UNICEF – in this research, as this "fosters a participatory design approach and safeguards the validity of the games and the overarching framework." The game sessions facilitated as part of the research could be made useful for these organizations and at the same time such "cases with and for such 'early adopters' of the method" would help in further disseminating and promoting the approach.

9. Monitoring and Tracking Systems for Better Protection of Humanitarian Aid Workers

Today 80% of humanitarian funding goes to conflict-driven disasters. Organizations in the field are confronted with mounting tensions as they seek to maintain access to populations in need. Those who try to provide aid are increasingly risking their own lives and safety. Technology such as satellite imagery, humanitarian UAVs, and more generally speaking remote sensing and monitoring promise to help humanitarian organizations to get access to local populations with limited risk to their staff. TU Delft researchers Tina Comes and Bartel van de Walle play a key role in the H2020 project iTRACK[2], a platform and network devoted to the design and development of technologies and policies that provide better protection in complex disasters. Together with their colleagues Lans de Kok and Ferre Westermann, they set out to develop a research agenda on this topic that will tailor the iTRACK project results towards Dutch NGOs and ministries.

"The lack of integrated real-time information prevents responders and local partners to develop an understanding of potentially threatening situations, increases response times and creates insecure communications or privacy violations, all leading to inadequate protection for humanitarians and beneficiaries", the researchers note. While many humanitarian organizations that experienced a lack of protection have taken steps to adapt, a key challenge is to organize collective action with regards to

- data collection and information sharing;
- coordination of technology development and design;
- identifying trends and drivers in violence against aid workers;
- development of collective policies and standards.

The issue paper resulting from this project combines a review of current standards and practices with insights from a practitioner workshop that was organized in April

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[2] http://www.itrack-project.eu/

2018 in the context of the first iTRACK simulation exercise in Delft. It pays attention to both Information Management (addressing among others data sensitivity and concerns about privacy) and Risk Management (particularly with respect to the introduction of new technologies and experimentation). The most relevant findings are summarized as follows in the issue paper:

> **"Information management**: While the humanitarian sector is embracing information technology, both the opportunities of data-driven approaches as well as their challenges and risks are not systematically analyzed. This relates to both technological innovation (e.g., tracking technology, artificial intelligence) as well as to the policies and standards that guide the use technology. More specifically there are questions regarding coordinated data collection and sharing standards; processing and analysis of data, especially including implications for vulnerable and digitally invisible populations; and how technologies can be evaluated and implemented. As information is scarce in complex disasters, it becomes a commodity, and information sharing challenges are a prime example of the complex coordination challenges within the humanitarian sector.

> In **risk management**, difficulties will arise from a lack of responsible innovation practices, and a lack of standards on information sharing. Particularly the remote access and analysis of information as well as the deployment of data collection e.g., through UAVs by unexperienced volunteers that do not subscribe to any code of conduct or standard is a source of risk. Similarly, there needs to be further guidance to manage undesired system inputs. There is thus a need for systematic research in risks that will arise from humanitarian innovations.

> **Looking forward** the calls to bridge the gap between academia and practice need to be met by dedicated programs. Strategies here include establishing joint projects and solution teams that help address concrete challenge as they arise in the field and combine scientific excellence with relevance. In addition, results need to be communicated and made available in ways to facilitate the uptake in the humanitarian world, including open access publications, and open source development of software along with dedicated documentation and trainings.

> Our **research program** foresees the evaluation of technology and policy through dedicated modeling and simulation approaches that help to understand and analyze the implications for decision-making. In addition, experiments, simulation exercises and field research with partner organizations will allow us to explore and understand the rich context of humanitarian operations. In combination, both methods will allow us to develop results on how information technology can improve coordination, effectiveness and efficiency of humanitarian operations."

10. Drones in the Service of Society

Though the word "drone" may conjure images of military and security applications, the reality is that the technology is now used across numerous sectors: agriculture, entertainment, journalism, infrastructure management, and activism, just to name a few. Small unmanned aerial vehicles are widely used by individuals and private companies alike. However, policy development has not kept pace with the new applications of this technology. To facilitate the creation of responsible regulations, policymakers need information about the qualitative and quantitative impacts that drones will have on society. In this project Aimee van Wynsberghe (TU Delft) has collaborated with Denise Soesilo (Swiss Foundation for Mine Action, FSD), Kristen Thomasen (University of Windsor, Canada) and Noel Sharkey (University of Sheffield) in order to provide policymakers, academics, and the public with objective information about the ethical, legal, and societal issues related to the drones that provide services to society in these numerous contexts.

In addition to an academic journal article, the pilot project has resulted in a consultation document that is made available under the flag of the NGO *Foundation for Responsible Robotics*. The summary of this report:

"Drones intended to serve the good of society open varied ethical and societal issues relating to intended use, application context, and involved stakeholders. [...] In this report the
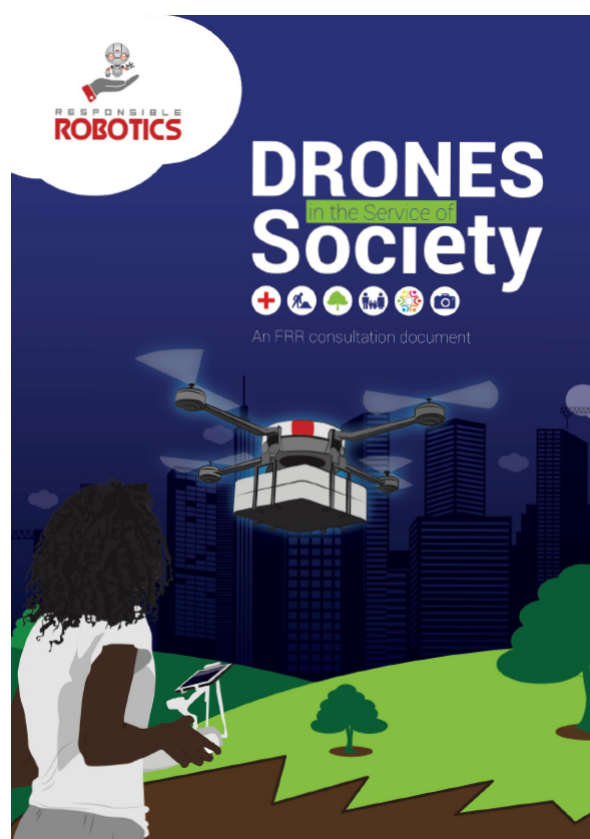
authors focus on five key areas of application; namely, humanitarian aid, responsible journalism, environmentalism, search and rescue, and social/political activism; and provide a preliminary assessment of ethical, societal, and human rights issues that may arise. Drones intended to serve the good of society open varied ethical and societal issues relating to intended use, application context, and involved stakeholders. From this exploration the following key findings have emerged:

1. "Reduction and/or mitigation of **psychological and physiological responses to drones** such as stress and trauma are key elements for maximizing the societal benefits of drones. There is urgent need for more detailed research to assist stakeholders in reducing the negative impacts.
2. **Heightened privacy considerations are required** and stricter stance on privacy and data protection guidelines is needed due to the potential impact on both drone operators and the individuals or groups whose data is being collected.
3. **Erosion of human rights** including infringements on human dignity and justice should be deliberated prior to launching drone operations. Such consideration should impact the whole process from the choice and design of the drones to the planning and strategy phases of operations.
4. **Coordination with professional rescue operations** should be a strict requirement for private groups (including NGOs) before initiating assistive operations in disaster zones. Otherwise, there is a risk of hampering or seriously impeding ongoing rescue and disaster relief.
5. **Consulting existing guidelines and professional codes of practice is essential** before private individual users or groups consider operations in fields such as humanitarian aid and journalism. There are existing policy documents and established codes of practice that need to be taken into account in the initial formulation of such projects."

This is not a comprehensive list of the ethical and social issues facing the widespread use of drones; however, it stimulates a discussion and focus on certain issues that have not received adequate attention in academia and research. It is very likely that the near future will contain prolific use of drones in multiple contexts for varied applications. It is the authors' belief that due consideration for these ethical and social issues will result in the development of powerful cross-disciplinary innovation for the good of society."

11. High-Quality Collective Intelligence for Humanitarians

Information is essential for an effective and timely response to complex humanitarian situations. Unfortunately, responders rarely have timely, high-quality information available for decisions and actions that are potentially lifesaving. Crowdsourcing of information is currently shifting the way humanitarian information management has been carried out traditionally. This "democratises" the field, greatly increases data volumes, and opens up many opportunities. On the other hand it also raises additional challenging issues regarding privacy, security and the verification of user-generated content. In this project Yilin Huang, Julius Gronendaal, Dimitris-Marios Vaporidis (TU Delft) and Christophe Billen (People's Intelligence) formulated a research agenda to further advance Verification of Humanitarian Information (VHI) methodologies and Humanitarian Information Systems (HIS).

The literature review that was done as part of this project revealed a number of shortcomings to existing HIS based on social media and crowd-sourcing (user-generated content or UGC):

1. Lack of effectiveness due to "information overload", "processing difficulties" and "a high risk of receiving inaccurate or incorrect information (including from malicious users)"
2. "No or limited evaluation of the reliability of the sources and the credibility of the information"
3. In case evaluation does take place, information is often judged to be "unsuitable for incorporation into established mechanisms for decision-making"
4. "A lack of feedback loops and empowerment of those (often among the affected populations) who contribute the information"

According to the researchers "four major types of (text-based) information detection and verification methods can be identified in the literature: 1) cross-validation, 2) expert opinion, 3) crowd-sourcing, and 4) machine learning." Their issue paper lists

limitations for each of these. They notice a trend in organizations from a "centralized internal approach" to verification towards a "community-based external approach" involving citizens and volunteers.

In addition, the researchers identified, described and reviewed existing crowd-sourcing projects with a humanitarian or human rights purpose (such as the Libya Crisis Map and Safecity India), also listing the technologies that they use (such as Ushahidi, which "stands out as the most used"). They summarized their findings as follows:

> "using emerging technologies such as crowd-sourcing and machine learning for information collection and verification is still in its infancy and shows many limitations. There are many challenges ahead calling for research and innovation. Many projects surveyed by this work lacked sound methodologies and relied heavily on human input for documentation and analysis. Recorded information lacked quality, and taxonomies differed between projects. Methodological standards appeared non-existent. Source evaluation as well as triangulation was a seldom phenomenon and could be optimized when present. Privacy, safety and security safeguards were rare. Save when projects were accompanied by grass-root activities, feedback loops to affected communities or information contributors had seldom been put in place, restricting empowerment opportunities. Often communication channels required users to have access to the Internet, which limited the user base to a more educated or resourceful crowd, and inhibited the participation and empowerment of less educated and disadvantaged crowds. Unless when the project are run by professionals, project initiators developed few synergies and partnerships with likewise projects and other concerned actors. More coordination, collaboration and knowledge sharing is needed in future projects."

Future research should, this project suggests, among others address the following topics:

- Learning from the methodologies and technologies for information collection and verification from (a) investigative journalism and (b) business / police / civilian / military intelligence
- Translating humanitarian information management principles into measurable information quality dimensions and metrics
- Using emerging technologies such as smart analytics, machines learning, crowd-sourcing and micro-tasking in the humanitarian domain

12. Artificial Intelligence (AI) & International Law

Artificial Intelligence or AI algorithms are rapidly becoming better as a result of being exposed to large amounts of (big) data. They can now outperform human experts in pattern recognition, reasoning, interpretation and analysis. AI is already being used to classify defendants in court and gauge the risk of repeat offending, in predictive policing, in profiling people and nudging them, and for weaponized systems that are independent of human control. It appears that AI technology has become so powerful in recent times that serious questions need to be raised about its regulation and governance. Yet there is hardly any substantial research in the field of international law and AI. This pilot project by Haye Hazenberg (TU Delft), Berenice Boutin (T.M.C. Asser Instituut) and Jeroen van den Hoven (TU Delft) set out to explore some of the issues and opportunities that AI presents for international law.

The issue paper that results from this project approaches the challenge of responsible innovation in AI from two angles:

1. The value-sensitive design angle, which stresses the role of ethical analysis and prospective legal regulation in developing new AI systems
2. The accountability angle, which seeks to conform current artificially intelligent systems to existing mechanisms of apportioning legal liability and holding actors accountable.

The paper explores the relation between international law and AI along two main lines: responsibility and regulation. With respect to responsibility it explores how responsibility for AI technology can or should be allocated to relevant actors, and which legal concepts are most appropriate - such as human control, collective responsibility, agency, and legal personality. With respect to regulation it focuses on the institutions and procedures that should guide the development of AI technology, and the role that international law can play in doing so. Some key points made in the paper are the following:

- "In view of the current and future developments of AI technology [described in the paper] it is well conceivable that the use of AI technology could lead to violations of [various international] norms."
- "Institutional structures and shared values influence the 'socio-technical' structure of artificial intelligence systems by setting their goals." In the US, for example, AI is mainly developed by the private sector and the military, while in a country like China the government takes the lead.
- "Divergence between regulatory contexts [...] drives divergences in AI development, which in turn generate different AI capabilities becoming available."
- "International law shapes the regulatory context in which AI develops in at least three ways: through its indirect effect on domestic law, through direct creation of international treaties by one or more states, and through a host of soft law private international standards."
- There is already widespread consensus on two central high-level design principles for AI. The first is that "future AI technology should be able to explain itself, in order to counter the obfuscation so far characteristic of machine learning algorithms. [...] The second is that of "meaningful human control'." The latter was explored in more detail in pilot project 3.
- "Different design choices will result in different arguments on which international actor(s) should bear responsibility in relation to the use of AI systems."
- In the case of AI multiple actors and institutions will generally be involved in internationally wrongful conduct. Models that should be explored included hybrid shared responsibility during intermediate states of AI development, strict liability for the consequences of AI, a principle of joint liability and models of indirect involvement.
- "Three newly emerging international AI-design norms can be discerned", but global coordination is needed. The first concerns "the public ownership of several particularly fundamental AI machine learning algorithms and big data sets." The second concerns the need to balance privacy concerns and individual rights against collective social benefits. Thirdly, "the public understanding of the exact relation between user data and the independent model learning needs to advance."
- "The shape that global coordination of AI should take is not pre-ordained. [...] A global conference on the future of AI regulation [...] would constitute a stepping opportunity for any regulatory advancements."

13. Responsible Innovation for Legal Empowerment

Legal empowerment is a "process of systemic change through which the poor and excluded become able to use the law, the legal system, and legal services to protect and advance their rights and interests." [3] Legal empowerment programs offer a good supplement to the 'rule of law orthodoxy', which focuses on building legal institutions, particularly judiciaries. Experience shows that the benefits of legal institutions do not automatically 'trickle down' to poor and disadvantaged populations. Legal empowerment programs therefore contribute to 'leaving nobody behind' (UN, 2016) in the process of working towards the achievement of SDG16. This project, executed by Ilse Oosterlaken (TU Delft), set out to explore a research agenda on responsible innovation to further advance legal empowerment. Special attention is paid to the challenge of measuring legal empowerment, as this contributes to the effectiveness of policies and programs.

The issue paper resulting from this pilot project starts with extensively discussing legal empowerment: the definition and history of the concept, what distinguishes it from the 'rule of law orthodoxy', different views on the challenge of realizing legal empowerment, internal and external barriers to legal empowerment, and the scope of legal empowerment programs. Responsible innovation requires interdisciplinary collaboration, and this chapter serves to give researchers from outside this application domain – such as from engineering fields – a first introduction to the topic.

Next, the issue paper sketches the legal empowerment ecosystem in The Hague. The region already contains several organizations that specialize in or do substantial work on legal empowerment, namely MicroJustice4All (a non-profit organisation working on legal empowerment for the most marginalized groups worldwide), Hiil (The Hague Institute for Innovation of Law) and IDLO (International Law and Development Organisation). The Institute for Economics and Peace (IEP) is also discussed, because of its expertise in measuring progress on SDG16 (which may be useful to measure legal empowerment). Attention for legal empowerment, it is argued, fits in

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[3] Commission on the Legal Empowerment of the Poor (2008)

with the plans of The Hague to consolidate and extend its international position as a 'legal delta.'

The third chapter in the issue paper discusses how legal empowerment can be measured. It identifies three approaches, each with their own advantages and challenges: measuring subjective legal empowerment through surveys (an approach taken by Hiil), using objective indicators of legal empowerment (similar to what IEP does for SDG16), and conducting contextual, subject-centric, process-oriented assessments (currently being started up by MicroJustice4All). They may be considered as complementary, as each is useful in different contexts and for different purposes. The chapter also briefly touches upon the relevancy of developments in big data and crowd sourcing data. It is worth exploring further how these can be taken advantage of to advance legal empowerment.

The fourth chapter sketches six possible research themes. The first two themes are connected to the issue of measuring legal empowerment, the last four themes to the challenge of increasing legal empowerment:

1. ICTs to acquire legal empowerment data from/for marginalized groups
2. Helpful generalizations about legal empowerment across contexts
3. Online portals and tools to increase legal empowerment,
4. Designing more inclusive socio-technical-legal institutions
5. Improving/up-scaling local legal empowerment innovations
6. Legal empowerment in refugee camps and slums.

For each theme some academic researchers and research groups in the region The Hague with relevant expertise have been identified.

14. Informal Settlements: Preserving Communities and Creating Public Goods

According to the UN, the world's population will grow 40% by 2050 and the urban population will double in just 35 years. Of the fast growing cities in the world 95% can be found in the Global South. Many governments in developing nations do not have the capacity or the will to plan for such explosive growth. As a result, approximately 3 billion people will live in informal settlements by 2050. Planners and designers must urgently address problems such as the lack of urban services and infrastructure, but they also need to address topics such as insecurity of tenure, poor accessibility to services and jobs, scarcity of public spaces and above all, the issue of social inclusion. How to confront informality, so that public goods can be delivered to the inhabitants of these settlements? How to make the barriers that divide the 'informal' city from the formal one more permeable, in order to achieve social sustainability? These questions were addressed in a pilot project by Roberto Rocco (TU Delft).

This pilot project took a unique approach, namely organizing an ideas competition under the title 'Confronting Informality.'[4] The competition was open to students from all over the world and encouraged the participation of multidisciplinary teams. All participating teams had to deliver a proposal to improve the living environment of an actual informal settlement in a city of the Global South. The proposals also had to point out the specific positive characteristics of the area, explaining how those will be preserved or enhanced. Proposals could be developed as a specific spatial project, or as an innovative land tenure or governance policy. In all cases, teams had to address and detail the impact of the proposal in the spatial conditions of the neighbourhood through drawings, maps, pictures, collages or diagrams. The site for intervention could be chosen by each team, but it had to fulfil the following understanding of informal urbanisation:

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[4] https://confrontinginformality.org/

"a set of unregulated, unplanned and often illegal ways of building cities that lead to both desirable and undesirable outcomes. Informal settlements usually have very low urban standards: lack of access to water and sanitation, little provision of public space, bad housing conditions, weak connection to the transportation networks or long commuting times, among others. They are exposed to urban segregation, high vulnerability to natural disasters and climate change and socio-economic problems, such as violence and crime."

Display of the SDGs at the Delft Faculty of Architecture & Urban Planning

There was a great response to the competition, with 50 teams from all over the world sending in their ideas. A jury with experts from several Dutch and foreign universities chose a winner, which was announced during a workshop on 7 June 2018 on the same topic, Confronting Informality, at the Delft Faculty of Architecture and Urban Planning. The submissions give a great overview of possible (innovative) solutions which may require more research. An issue paper on the topic will soon be finalized by project coordinator Roberto Rocco.

Contact

Secretariaat-DenHaag@tudelft.nl

Turfmarkt 99 5th floor

2511 DC The Hague

Or:

Secretariaat-VT-TBM@tudelft.nl

Jaffalaan 5

2628 BX Delft